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From the Editors

Populations of frog species have declined globally in the past twenty years. It is a matter of debate as to whether or not this is due entirely to climate change, but the more attention that can be focused on these amphibians the better we will be to make that judgement. We are pleased to offer in this issue of *The Victorian Naturalist* a small collection of papers on the subject of frogs, which will contribute to this discussion.

The specific foci of these papers range include the effect of fungus on populations of Alpine Tree Frogs following the 2009 bushfires; an extension in range of the Bleating Tree Frog; a call record for a frog species rarely heard in Victoria; and opportunistic use of vegetation by Southern Brown Tree Frog in suburban Melbourne. A review of Chris Mattison's *Frogs and Toads* is included here to add to this theme.

The issue also includes another piece of natural history observation by a long-standing contributor to this journal, John Whinray, who is a resident of Flinders Island, where his interests range widely across the local flora and fauna. In this instance his attention is focused on the subject of land slaters.

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Front cover: *Litoria ewingii* and cockroach on *Dianella* sp. in the garden. Photo by Maria Gibson. See page 275.

Back cover: *Correa reflexa*. Photo by Dan Carey.

The Bleating Tree Frog *Litoria dentata* Keferstein (Anura: Hylidae): an addition to the frog fauna of Victoria

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Abstract
The Bleating Tree Frog *Litoria dentata* is a pond-breeding species distributed along the east coast of Australia from southern Queensland to southern New South Wales. We report the discovery of a population of this species in Victoria, near Genoa, East Gippsland. This finding constitutes a southerly range extension for the species and takes to 38 the number of frog species known to occur in Victoria. (*The Victorian Naturalist* **128** (6) 2011, 256-259)

Key Words: *Litoria dentata*, range extension, amphibian, tree frog

Introduction

The Bleating Tree Frog *Litoria dentata* Kerferstein is a pond-breeding species morphologically similar to the Southern Brown Tree Frog *L. ewingii*. It is distributed along the eastern slopes of the Great Dividing Range, predominantly in the lowlands and coastal hinterlands of New South Wales and south-east Queensland (Cogger 2000). The species is widespread and considered secure within its range (Hero *et al.* 2006). *Litoria dentata* has been found in a wide variety of habitats, including coastal heathlands and woodlands, dry forest, rainforest and urban environments (Anstis 2002; Cogger 2000). It typically breeds in seasonally inundated grassy swamps after or during spring and summer rainfall (Anstis 2002), and has a loud and distinctive advertisement call accurately described as 'a long penetrating, wavering bleat' (Cogger 2000: 136).

The previous southernmost records of *L. dentata* are from the northern end of Nadgee Nature Reserve in the south-eastern corner of New South Wales (National Parks and Wildlife Service 2010). Wildlife surveys in eastern Victoria, including those that have targeted frogs, have not encountered this species previously.

Identification

Litoria dentata is a relatively small tree frog attaining a maximum length of 45 mm. It has a dark brown band along its dorsum, usually commencing at the snout, and variing in width, being narrowest over the shoulders. The dorsum on either side of this band and the upper surfaces of the limbs are creamy-brown to yellow. The flanks and concealed parts of the limbs are often yellow, especially in males. Ventral surfaces are also yellowish; males have a dark olive brown or black throat. The skin is smooth above, or with a few very small tubercles, and granular below except on the throat. There is a prominent inner metatarsal tubercle and no outer one. The tympanum is very distinct. The finger and toe discs are of moderate width and wider than those of *L. ewingii*. Webbing is also more extensive than that of *L. ewingii*; fingers are nearly one-third webbed and toes are nearly three-quarters webbed (Cogger 2000).

Observations

In East Gippsland during December 2010, we conducted an amphibian survey commissioned by the Victorian Department of Sustainability and Environment. The primary purpose of this survey was to search for the endangered Southern Barred Frog *Mixophyes balbus*, which has not been seen in Victoria for nearly 30 years (Gillespie and Hines 1999). However, while surveying, we also took the opportunity to undertake a search for other frog species. On 2 and 5 December 2010, nocturnal aural surveys for frogs were conducted along the Genoa River Valley from Wangarabell to the coast, east of Mallacoota. Sampling was undertaken by driving along roads that followed or traversed the valley, with halts every few hundred

Table 1. Details of Victorian localities at which *Litoria dentata* was found, along with other species present.

	Site 1	Site 2	Site 3
Location	37° 28' 47.4" 149° 36' 52.1"	37° 28' 57.3" 149° 35' 55.4"	37° 29' 1.0" 149° 36' 2.6"
Elevation (m a.s.l.)	20	21	21
Species			
Litoria dentata	+	+	+
Litoria aurea		+	
Litoria ewingii			+
Litoria peroni	+	+	+
Litoria verreauxii		+	+
Crinia signifera		+	+
Limnodynastes dumerilii		+	+
Limnodynastes peronii	+	+	

metres to listen for frog calls. Also during the daytime reconnaissance of roads, other potential frog breeding sites at various dams, swamps and gullies were located and documented by GPS for targeting at night. Conditions on both nights were overcast with intermittent rain, approximately 20°C and >95% humidity.

Litoria dentata was located at three sites along the Genoa-Mallacoota Road, approximately 1.1–4.5 km east of the township of Genoa (Table 1). The frogs were easily identified by their advertisement call. On 2 December a small chorus of approximately 5 males was heard at the first site, and a much larger chorus of at least 20 males was calling from the second site, at which we also observed several pairs in amplexus (Fig. 1). Two individuals were collected from each of these localities and lodged with Museum Victoria (specimen nos. MVD74930-74933). On 5 December, *L. dentata* was not heard at either of these sites, but a single male was heard calling at a third site. Seven other frog species were also located at these sites, including a nationally threatened species the Green and Golden Bellfrog *Litoria aurea*, (Department of Sustainability, Environment, Water, Populations and Communities 2010) (Table 1).

All sites were in farmland on the floodplain of the Genoa River at an elevation of approximately 20 m ASL. The sites were similar, each comprising a shallow rain pool <30 cm deep and 100–300 m^2 in area, with extensive dense emergent and fringing grasses and herbs. This habitat is typical of *L. dentata* breeding sites observed in New South Wales (G Gillespie pers. obs.).

Significance

This finding constitutes an addition to the frog fauna of Victoria and a significant southerly range extension for *L. dentata*. The nearest known records are approximately 40 km further north in New South Wales (Fig. 2).

Why has this population not been located previously? The site is highly accessible and numerous herpetologists, including both authors, have visited the area at times over the past 50 years, as reflected in the records of the Victorian Biodiversity Atlas (Department of Sustainability and Environment unpublished). Biodiversity surveys that included amphibians have also been undertaken in the local area (e.g. Gillespie *et al.* 1992; Sutter *et al.* 1992). The call of *L. dentata* is loud and unmistakable; a single calling individual is audible, even over the calls of other frog species, over a distance of 100 m (G Gillespie pers. obs.).

It is possible that this range expansion is a result of climate change, though this would be surprising given that the prolonged drought in south-eastern Australia which would not have been conducive to frog population movements. It is also conceivable that the population represents a deliberate or accidental introduction (as in the case of *Litoria fallax*; Gillespie and Clemann 2000), but its location far from a human population centre suggests that this is also unlikely. In light of the species being an explosive breeder, that is active only sporadically after heavy rain, it is most probable that the population represents a small relic of a once-wider distribution, which may have been missed by earlier surveys.

Fig. 1. Pair of *Litoria dentata* in amplexus, from site 2 in Table 1.

Several frog species have been added to the Victorian list in recent years (e.g. Gillespie and Hunter 1999; Gillespie and Clemann 2000). *Litoria dentata* is unlikely to be the last. The known distributions of other species, such as the Broad-palmed Frog *Litoria latopalmata* and the Jervis Bay Tree Frog *L. jervisiensis*, also come very close to the border (NPWS 2010), and it is entirely possible that these species occur in Victoria. The discovery of *Litoria dentata* in Victoria highlights the fact that knowledge of the distribution of biodiversity in this most densely-populated of Australian states is by no means comprehensive.

Acknowledgements
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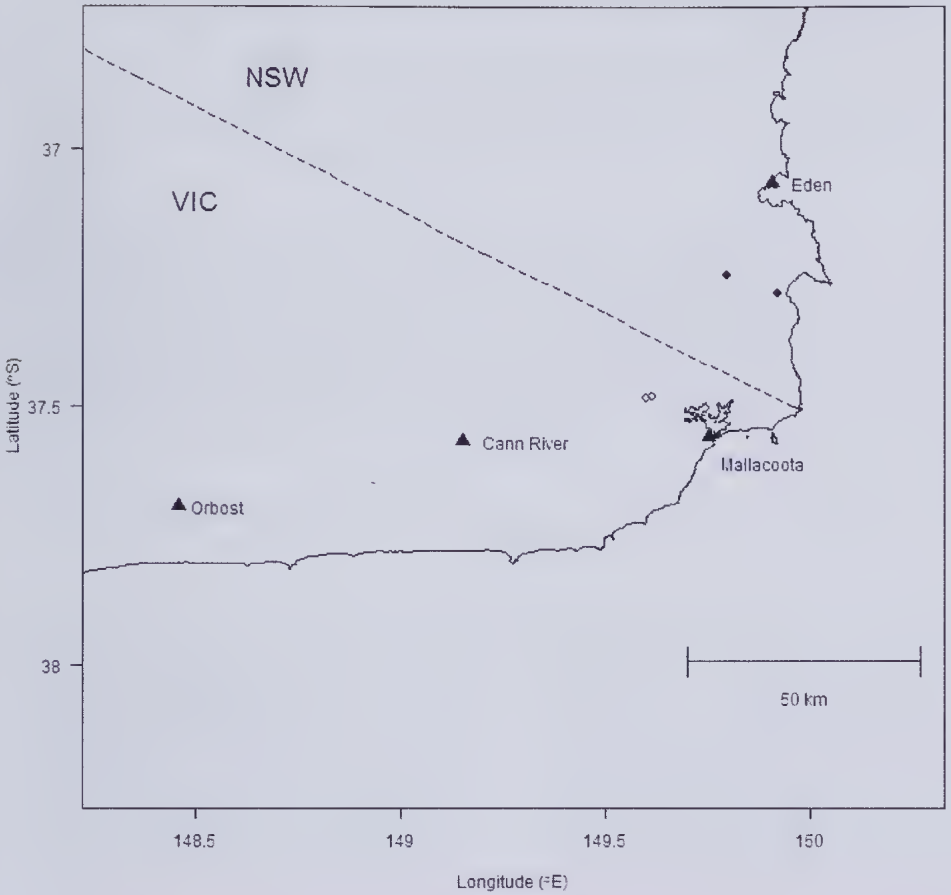

Fig. 2. Distribution of *Litoria dentata* in eastern Victoria and southeastern New South Wales. Open circles – new localities in Victoria; solid circles – nearest historic localities in New South Wales Source: Atlas of NSW Wildlife (NPWS 2010).

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A tale of two mountains: fire, fungus and Alpine Tree Frogs

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Abstract
The Victorian fires in February 2009 burnt habitat once occupied by the nationally threatened Alpine Tree Frog *Litoria verreauxii alpina*. During November 2009 day and night frog surveys were conducted at Lake Mountain and nearby Mount Bullfight Nature Conservation Reserve. Despite historical records, Alpine Tree Frogs were not recorded at Lake Mountain, but were discovered at Mount Bullfight which was surveyed for frogs for the first time. The apparent absence of Alpine Tree Frogs from Lake Mountain pre-dates the fire according to prior observations of decline and probable disappearance. The persistence of the subspecies on Mount Bullfight may be related to this site's remoteness and resultant lack of exposure to Amphibian Chytrid Fungus. We detected the fungus at Lake Mountain but not at Mount Bullfight. Preventing the introduction of Amphibian Chytrid Fungus to Mount Bullfight is likely to be crucial in retaining its current frog diversity. (*The Victorian Naturalist* 128(6) 2011, 260-265)

Keywords: *Litoria verreauxii alpina*, Lake Mountain, Mount Bullfight Nature Conservation Reserve, Amphibian Chytrid Fungus, Black Saturday fires

Introduction

The Alpine Tree Frog *Litoria verreauxii alpina* is listed as Threatened under the Victorian *Flora and Fauna Guarantee Act* 1988, Critically Endangered by Department of Sustainability and Environment (2007), and as Vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act* 1999. A draft Victorian Action Statement (Clemann pers. comm.) and a draft National Recovery Plan (Clemann and Gillespie 2007) have been prepared for this subspecies.

Historically, the Alpine Tree Frog was distributed across most of the high country of the south-eastern Australian mainland (Osborne *et al.* 1999) (Fig. 1). Within this broader range, the frog currently has a small and fragmented geographic distribution due to its restriction to isolated mountain peaks and plateaux. Within Victoria, records of the Alpine Tree Frog extend from the vicinity of Tom Groggin near the Murray River in the north-east of the state, across the higher altitudes of the Great Dividing Range, to Mt Baw Baw in the south-west of the taxon's range (Fig. 1). Although the Alpine Tree Frog was once common and abundant throughout its range, there have been severe declines in recent decades (Clemann and Gillespie 2007).

Within the Recovery Plan, disease (chytridiomycosis, caused by the Amphibian Chytrid Fungus), climate change and ultraviolet-B radiation have been identified as threats. Another potential threat is the likely increase in the frequency, extent and severity of wildfire due to climate change or extended periods of drought. Of particular concern is the Amphibian Chytrid Fungus, which has been strongly implicated in the declines of amphibians worldwide (Berger *et al.* 1999). It infects the mouthparts of tadpoles and the skins of frogs, ultimately resulting in the death of many of the infected frogs. The disease has been detected in Alpine Tree Frog populations in the Snowy Mountains, the Dargo High Plains and around Mount Hotham (Hunter *et al.* 2008; Clemann *et al.* 2009).

Extensive wildfires in south-eastern Australia in early 2009 burnt through large areas of Victoria, following a period of exceptional weather, with many records set for maximum temperature, heatwave duration and low rainfall (Bureau of Meteorology 2009). Lake Mountain lies within the Yarra Ranges National Park in the Victorian Central Highlands. Mount Bullfight Nature Conservation Reserve (NCR) is situated approximately seven kilometres north-east of

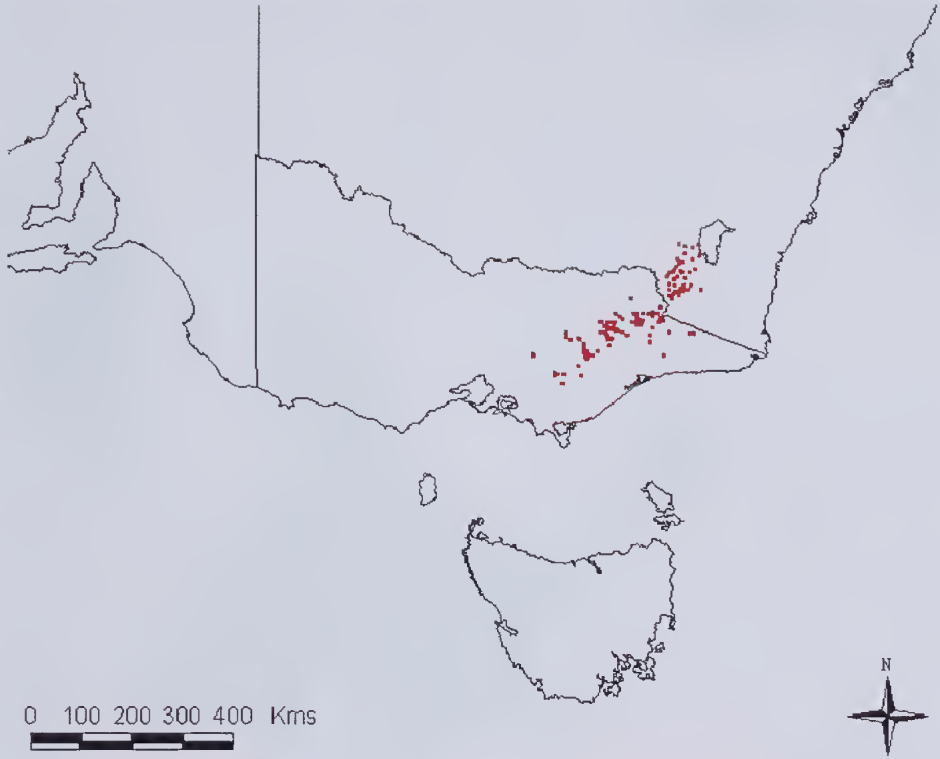

Fig. 1. Historic records (red dots) of the Alpine Tree Frog (sources: Atlas of Victorian Wildlife Database, Atlas of New South Wales Wildlife database, Museum Victoria, Australian Museum).

Lake Mountain. On Black Saturday, 7 February 2009, 70 years after last being burnt in 1939 (Ashton and Hargreaves 1983), the entire Lake Mountain plateau, including all woodlands, heathlands and mossbeds, was burnt by wildfire (Fig. 2). The fires were rapid-moving and severe, with all mossbeds on the Lake Mountain plateau burnt at high intensity over at least 80% of their area (Tolsma and Shannon 2009). At Mount Bullfight NCR, 98% of the reserve was burnt; importantly, the fire in this reserve was of a lower intensity than that at Lake Mountain (Tolsma and Shannon 2009).

The collection of numerous specimens of Alpine Tree Frogs from Lake Mountain during the 1960s indicates they were once common in this area, with the last voucher specimen collected in 1970. Only one Alpine Tree Frog has been recorded since then, in 1993 (Victorian Fauna Database). Unfortunately this individual was only heard and not observed. This record was therefore treated cautiously given uncertainty in the species taxonomy, as well as the similarities between the call of the Alpine Tree Frog and other related species. In contrast, there are no historic records of Alpine Tree Frogs from Mount Bullfight NCR: no extensive surveys had been conducted in this area.

The objectives of this study were to investigate the threatening processes of fire and Amphibian Chytrid Fungus on the Alpine Tree Frog, at both Lake Mountain and Mount Bullfight NCR.

Methods

Frog surveys were conducted at 13 sites at Lake Mountain on the 24 November 2009 and six sites at Mount Bullfight NCR on the 25 November 2009 (Fig. 2). Initial site assessments were conducted during the day, when site location coordinates were collected using a Garmin 60CSx GPS unit; a site photograph was taken,

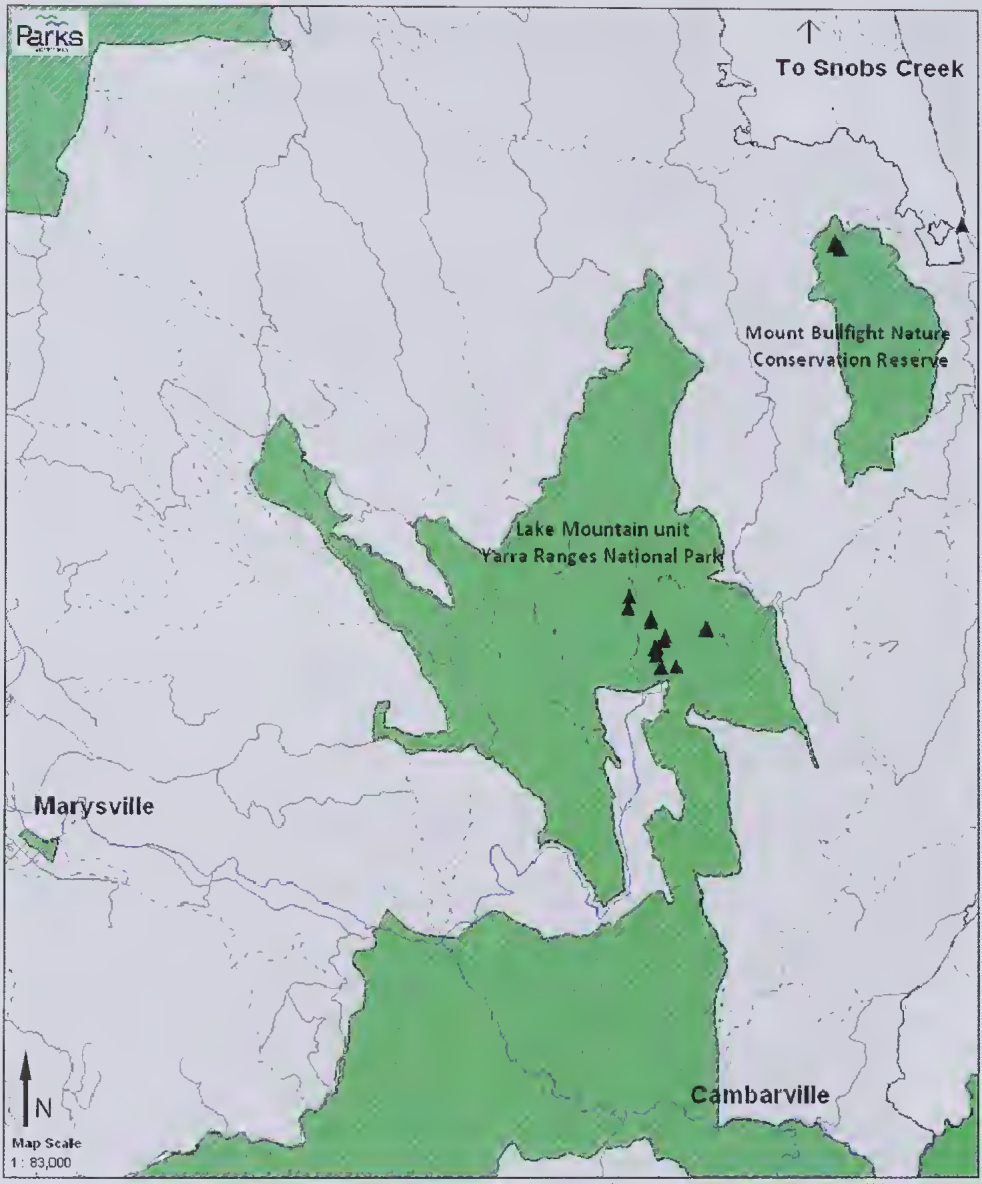

Fig. 2. Location of sites surveyed for frogs in November 2009 at Lake Mountain and Mount Bullfight Nature Conservation Reserve. Areas in green represent land managed by Parks Victoria and the hatched areas represent the extent of the Black Saturday Fire.

and a general description of the waterbody being surveyed was made. The following site attributes were recorded: site burnt or not burnt, type of waterbody (bog or stream), presence or absence of vegetation around and within the waterbody, and presence of tadpoles and/or frog egg masses.

During night surveys, a period of 10 minutes was spent listening for frogs, identifying calling frogs and estimating the number of calling in-

dividuals. A visual search (aided by torchlight) was undertaken to capture frogs. Any frogs that could be captured were swabbed for diagnostic testing for Amphibian Chytrid Fungus. Swabbing of frogs involved rubbing a sterile swab (Medical Wire and Equipment, MW-100) along the ventral and dorsal surfaces of the frog, in the groin area, and in the palm of the hand as the frog gripped the swab. Each swab was labelled with the site location, species and date. After swabbing, frogs were released at their points of capture. Fresh disposable gloves were used to handle each frog in order to prevent transmission of the fungus between individuals. Researcher's hands and footwear were sprayed with a solution of methylated spirits and water between sites to prevent the spread of pathogens.

If tadpoles were present, up to five were collected from each waterbody for later analysis for the presence of the Amphibian Chytrid Fungus. Swabs and tadpoles were sent to the Australian Animal Health Laboratories, Commonwealth Scientific and Industrial Research Organisation (CSIRO), to test for the Amphibian Chytrid Fungus. CSIRO analysed the samples by Taqman real-time PCR assay, using the methods described by Boyle *et al.* (2004).

Results

Surveys

Ten months after the Black Saturday fires little regeneration of ground-level vegetation was evident in much of the area surveyed during this study. Within the wetter habitats Mt Bullfight NCR retained a large proportion of unburnt vegetation, whereas these habitats had been almost entirely burnt at Lake Mountain.

Three species of frogs were detected at Mount Bullfight NCR; the Alpine Tree Frog, Common Froglet *Crinia signifera* and Brown Tree Frog (either *Litoria ewingii* or *L. paraewingi*, but henceforth referred to as *Litoria ewingii* complex). Up to 10 Alpine Tree Frogs were heard calling throughout the main bog system. As Alpine Tree Frogs sound similar to many of the *Litoria ewingii* complex frogs, it is not possible to determine the precise number of Alpine Tree Frogs calling. Some frogs were also hand caught, with one individual retained as a voucher specimen. Approximately 75% of this main bog system was burnt in the Black Saturday fires. Alpine Tree Frogs were caught and/or calling from the verges of pools in both unburnt and burnt areas of the bog.

In contrast to Mount Bullfight NCR, no Alpine Tree Frogs were recorded at Lake Mountain. The Common Froglet was the only species recorded with adults and tadpoles detected at all 13 sites (Table 1). There were large choruses of 20 or more Common Froglets calling at numerous localities at Lake Mountain. In comparison, few individuals of Common Froglets were heard calling at Mt Bullfight NCR, though on one occasion a chorus of approximately 10 was heard calling.

Amphibian Chytrid Fungus

All samples collected at Lake Mountain (38 swabs, 33 tadpoles) were from Common Froglets. Eighteen swabs were collected at Mt Bullfight NCR. Two of these were from Alpine Tree Frogs, one of which was collected in early January 2010 during lizard surveys conducted by Clemann and Antrobus (2010); seven were from Common Froglets, and nine were from *Litoria ewingii*-complex frogs. Fifteen tadpoles were collected at Mt Bullfight NCR, with tadpoles from sites B2, B3, B4 and B5 identified as Alpine Tree Frogs using molecular analyses (Katie Smith, Museum Victoria). One metamorph Alpine Tree Frog was collected during

Table 1. Frogs detected at Lake Mountain (24 November 2009) and Mount Bullfight Nature Conservation Reserve (25 November 2009).

Location	Number of sites surveyed	Number of sites where frogs were detected					
		Common Froglet		*Litoria ewingii* complex		Alpine Tree Frog	
		Tadpoles	Adults	Tadpoles	Adults	Tadpoles	Adults
Lake Mountain	13	13	13	0	0	0	0
Mount Bullfight	6	4	1	3	6	4	1

the survey by Clemann and Antrobus (2010), and this specimen was also tested for the Amphibian Chytrid Fungus.

Of the 38 swab samples that were collected from Common Froglets at Lake Mountain, 18 were positive for the Amphibian Chytrid Fungus, three were negative, 16 were inhibited and one was indeterminate. Inhibited results represent a failure of the diagnostic test, and cannot be interpreted as either positive or negative. Of the 33 tadpoles collected at Lake Mountain, all were negative.

Of the 18 swab samples collected at Mount Bullfight NCR, 11 were negative for the Amphibian Chytrid Fungus, and seven were inhibited. Of the 15 tadpoles that were collected at Mt Bullfight NCR, all were negative. An Alpine Tree Frog collected as a voucher specimen at Mt Bullfight NCR in January 2010 was also negative.

Discussion

The Alpine Tree Frog has not been sighted at Lake Mountain for nearly 20 years, despite more recent surveys in the area (Clemann 2002; this study). In addition to the Common Froglet and Alpine Tree Frog, at Lake Mountain there are historic records of the Victorian Smooth Froglet *Geocrinia victoriana*, Southern Toadlet *Pseudophryne semimarmorata* and a member of the *Litoria ewingii* complex (either *L. ewingii*, *L. paraewingi*, or a hybrid of these species) (Victorian Fauna Database 2007). Apart from the Common Froglet, none of the taxa was recorded at Lake Mountain during this survey (we did not expect to hear the Southern Toadlet as the breeding season for that species is around March to April). In contrast, Alpine Tree Frogs have persisted at Mount Bullfight NCR, and the Victorian Smooth Froglet and *Litoria ewingii* complex frogs were both recorded there during this survey or that of Clemann and Antrobus (2010).

Lake Mountain is one of several locations in the uplands of south-eastern Australia where the Alpine Tree Frog is believed to have disappeared. Patterns of decline in this subspecies have been inconsistent. It persists in Kosciusko National Park, the upper Dargo High Plains and between Mount Hotham and the Dinner Plain area, and some small, isolated areas such as Mount Bullfight NCR (Hunter *et al.* 2008; Clemann *et al.* 2009), but has apparently disappeared from the Baw Baw Plateau, Lake Mountain and the Bogong High Plains.

Large and/or too-frequent fires are considered a threatening process for some threatened alpine herpetofauna that have extremely restricted distributions, or those that require specific, and often geographically limited and fragile habitats (Clemann 2003, 2007; Clemann and Gillespie 2007). Although fire is listed as a potential threat in the draft National Recovery Plan for the Alpine Tree Frog (Clemann and Gillespie 2007), fire does not appear to be negatively influencing the status of populations of this subspecies that we have studied. Although sections of their habitat were burnt on Black Saturday, Alpine Tree Frogs persist at Mount Bullfight NCR. They also persist in the area severely burnt by the Dargo–White Timber Spur fire on Black Saturday (Clemann *et al.* 2010; Howard *et al.* 2011).

Amphibian Chytrid Fungus is widespread amongst Common Froglets at Lake Mountain, whereas it was not detected at Mount Bullfight NCR. We believe the apparent absence of Alpine Tree Frogs from Lake Mountain is most likely attributable to the disease chytridiomycosis, caused by the Amphibian Chytrid Fungus. This hypothesis is supported by the high levels of fungus detected on the Common Froglets at Lake Mountain, and the apparent disappearance from the area of other species that have been previously recorded there. In comparison, the higher diversity of frog species at Mount Bullfight NCR (including the Alpine Tree Frog), as well as its remote location and the negative results that we obtained from samples for the Amphibian Chytrid Fungus, suggest that this site may be free of the disease: however, we were able to test only a modest number of samples from Mount Bullfight NCR (34), and further sampling is needed to provide greater confidence that the site is free of the fungus.

It is plausible that the Common Froglet is more resistant to and may be a carrier of the fungus. The Common Froglet remains abundant at Lake Mountain, as it does in areas of the Australian Alps where the Alpine Tree Frog has also disappeared and where sampling has revealed the presence of the Amphibian

Chytrid Fungus (Hunter *et al.* 2008; Clemann *et al.* 2009). Conversely, in areas where the Alpine Tree Frog persists, the Common Froglet is often either absent, absent from the specific waterbodies containing Alpine Tree Frogs, or occurs at much lower densities (D Hunter pers. comm.; this study). The fungus is spread through the movement of infected frogs, tadpoles, water and soil (Allan and Gartenstein 2010). Limiting the exposure of this site to only necessary vehicles and foot traffic may reduce the risk of transmission. Recent recommendations for hygiene protocols (Phillott *et al.* 2010) when working in areas of significance for amphibians should be observed by all who work in Mount Bullfight NCR.

Given the threatened status of the Alpine Tree Frog at both a national and state level, we recommend annual monitoring at Mount Bullfight NCR, as well as continued sampling of frogs to more confidently confirm the presence or absence of the Amphibian Chytrid Fungus from this site.

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Some land slater (Isopoda: Oniscoidea) records for Banks and eastern Bass Straits, and Wilsons Promontory

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Abstract
Nineteen species of land slaters (Isopoda: Oniscoidea), two of which are exotics, are recorded for Tasmanian islands of Banks and eastern Bass Straits. Specimens were obtained from 37 of the 100 visited islands. Six of the native species have been found only on the eastern islands to date. One taxon is known from just Deal Island and Wilsons Promontory. Another is known with certainty from two islands and there is a possible record of it for Wilsons Promontory. Two slaters, formerly thought to be Tasmanian endemics, are recorded for the first time on the Australian mainland, at Wilsons Promontory. Comments are made on the habitat of some of the species, and the range and extent of the collecting. The distribution of several species, and their probable origins, are discussed. A table of the known distribution of the 19 taxa is presented. (*The Victorian Naturalist* **128** (6), 2011, 266–271)

Key words: native land slaters, exotic land slaters, Banks Strait, eastern Bass Strait, Wilsons Promontory, Isopoda, Oniscoidea.

Introduction

The first species of land slater recorded for the eastern Straits was the Ranga Cave Slater *Echinodillo cavaticus* Green which was described from specimens obtained on Flinders Island (Green 1963). The site is the largest calcarenite cave of the eastern Straits and the species has not yet been found elsewhere.

The author's first collection was taken at Killiecrankie Bay on the north-west coast of Flinders Island in 1966. The specimen of Shore Slater *Ligia australiensis* Dana, was not acknowledged when forwarded to the then National Museum of Victoria.

Some slaters were collected in 1972 at The Stacks during a visit for the collection of cave-crickets. They were forwarded to the Tasmanian Museum because AJA Green, the Curator of Invertebrates, had described the Ranga Cave Slater. Her prompt reply stated that the specimens were an undescribed species that did not occur on the Tasmanian mainland. A new species was exciting and so the collecting was continued. Eighty-seven lots were taken that year and they included five or six undescribed species. By the end of 1979 a total of 224 collections had been gathered on 34 islands of Banks and eastern Bass Straits, and at Wilsons Promontory. All were lodged at the Tasmanian Museum and Art Gallery, Launceston.

The collecting has only been spasmodic since the end of 1981. Not even one of the new species has yet been named, almost 40 years since the first was found. So they are dealt with below under their generic or family names. Later they shall be nominated for entry on the schedules of the Tasmanian *Threatened Species Protection Act* 1995.

The Slaters

The exotic species are prefixed by an asterisk. Two taxa, the Shore Slater and the Garden Slater **Porcellio scaber*, already have common names. Suitable names have been assigned to the balance of the species (Table 1).

Shore Slater *Ligia australiensis* Dana, 1853
This large slater lives on the shore at and just below high water level. It is likely to occur on most of the eastern islands and islets, not just those of the table. However, several of the smallest spots, such as Pyramid Rock and Round Islet (Hogans Group), are iron-bound and may lack enough habitat to sustain a population.

Coast Slater *Styloniscus* sp.
The Coast Slater is likely to be more widespread within the currently-known range from Long Islet at Hogans Group down to Cape Barren Island. It was generally found in wrack at about high water level or just below it and did not extend out onto the stony coast with the Shore and Slow Slaters. It is endemic to the eastern islands.

Slow Slater *Deto marina* (Chilton, 1884)
This species occurred on the coast in the same zone as the Shore Slater. It, too, is likely to

Table 1. Land slater records for Banks and Eastern Bass Straits, and Wilsons Promontory. The endemic species of the Eastern Straits are given in the first column. x = a specimen or specimens lodged at the Tasmanian Museum and Art Gallery. The records for the Tasmanian mainland are from four of Green's papers listed under References.

	Endemic	Wilsons Prom.	Hogans	Long Islet	Erith	Deal	North East	The Stacks	Pyramid Rock	Flinders	Sentinel	Roden	Prime Seal	Chalky	Mile	Isabella	Little Chalky	Kangaroo	Big Green	Chapelle	Badger	Little Goose	Goose	Little Dog	Little Green	Big Dog	Isabella Reef	Woody	Tin Kettle	Vansittart	Long	Cape Barren	Beagle Reef	Battery	Preservation	Clarkes	Penguin	Sea Lion	Swan	Tas. Mainland
Ligia australiensis			x			x		x		x		x	x		x			x	x	x	x		x	x	x		x		x	x		x		x	x	x			x	m
Styloniscus sp.	e			x	x	x				x				x										x								x								
Deto marina			x		x	x		x		x	x	x	x	x	x	x		x	x	x	x		x	x			x			x		x		x	x				x	m
Armadilloniscus sp.	e									x																						x								
Plymophiloscia ulverstonensis		x	x	x	x	x	x	x	x	x	x		x					x					x	x		x	x			x		x		x	x	x		x	x	m
?*Laevophiloscia* sp.	?	?								x																						x								
?*Trachelipidae* No. 1					x					x	x	x			x				x	x	x	x	x		x							x	x	x						m
?*Trachelipidae* No. 2		x				x																																		
Actaecia bipleura																																x								m
Actaecia thomsoni					x																																x			m
Actaecia cyphotelson					x																																x			m
Cubaris sulcifrons				x	x						x		x									x										x	x	x						m
Cubaris tamarensis		x								x											x											x			x	x				m
Cubaris sp.	e					x				x																														
?*Merulana* sp.	e		x	x	x	x		x	x	x		x	x	x	x		x	x	x	x	x	x	x		x	x	x	x	x			x			x	x		x	x	
Sphaerilloides sp. No. 1	e		x	x	x	x			x																															
Sphaerilloides sp. No. 2	e									x																														
**Porcellio scaber*						x				x			x					x			x							x	x	x	x	x			x					m
**Armadillidium vulgare*										x																														m

occur, not just where recorded so far, but on nearly every island and islet right across the eastern Straits.

Rishell Slater *Armadilloniscus* sp.
The Rishell Slater was found at the head of Bungs Bay, on the far west coast of Cape Barren Island, when the author's friend, Sarah Rachel Mansell (1908–1988), showed him where she gathered the Brown Rishells *Truncatella vincentiana* (Cotton 1942) for her strings of shells. The common name results from the elision, in the Cape Barren dialect of English, of part of the name Rice Shell, given because the shells look somewhat like grains of rice. Mrs Mansell's spot, one apparently used for generations by people of Aboriginal descent, was deeply-piled weed that was mainly Sea Nymph *Amphibolis antarctica*. Dunmage and driftwood were buried with the Rishells in the rotting weed. The author noticed minute slaters on the wood and they turned out to be the first record, for the southern hemisphere, of the genus *Armadilloniscus*. (AJA Green, pers. comm.).

Later, the species was found at the tip of Long Point on Flinders Island. It occurred there, with Brown Rishells, under a piece of driftwood in piled Ribbon Weed *Posidonia australis* just above high water level. Unlike the one at Bungs Bay, the local deposit was small and shallow.

Furneaux Slater ?*Laevophiloscia* sp. (A species close to *Laevophiloscia*)
The first record was made at high water level in Petrification Bay on southern Flinders Island. It was under damp wrack that was mainly Ribbon Weed, washed in from the extensive mudflats. Later the Furneaux Slater was collected once on Cape Barren Island. There it occurred in leaf litter under simple scrub regrowth about 400 m south of The Township. One juvenile male, very similar to the local material, was chanced on in the Foleys Road Camping Ground at Townshends Point on Wilsons Promontory. The site was under a partly-buried log about 60 m in from high water level. The remnant local vegetation consisted of eucalypts, Coast Banksia *Banksia integrifolia* and South-eastern Broom-heath *Monotoca elliptica*. The species has yet to be seen away from these two or three spots.

Slender Slater *Plymophiloscia ulverstonensis* Green, 1961
The Slender Slater occurred right across the eastern Straits and was even found in scrub near Tidal River on Wilsons Promontory. Until the latter record was made, it was known as a Tasmanian endemic (Green 1961, and AJA Green, pers. comm.). The highest record was made at about 340 m ASL in the major western rainforest remnant of Mount Munro on Cape Barren Island.

Straits Slater ?Trachelipidae No. 1 (A species close to Trachelipidae No. 1)
The Straits Slater was collected across the central part of the Straits from Erith Island at Kents Group down to tiny Battery Island in Armstrongs Channel between Cape Barren and Clarke Islands. It too is endemic to the eastern islands.

Litter Slater ?Trachelipidae No. 2 (A species close to Trachelipidae No. 2)
This species was first found amongst leaf litter in the tall scrub of Blackwood Gully on the southern side of Deal Island's central hill. The author spent a long time trying to find enough slaters for a collection as the species was novel to him. The area was burnt black several weeks later in the severe bushfire of late December 1972 and there was no trace of the species there up to the end of 1974. However, it was noticed in a tiny unburnt remnant of Shining Peppermint *Eucalyptus ambigua* and scrub on the saddle at the head of a minor gully that drains south to the head of Freestone Bay. It was later found at Townshends Point, on Wilsons Promontory, with the species that shows some features of the Furneaux Slater.

Plage Slater *Actaecia bipleura* Lewis and Green, 1994
The sole collection of this species was made at night on the bared sandy section of the western end of Prickly Bottom Beach on Cape Barren Island.

Sand Slater *Actaecia thomsoni* Green, 1966
There were thousands of these slaters at night on the northern part of the sand beach bared at Bulli Bay on Erith Island. Later a few specimens were found on recently-bared sand during the

afternoon ebb on the south-western shore of Penguin Island. The latter is in the south-eastern corner of the Furneaux Group.

Beach Slater *Actaecia cyphotelson* Lewis and Green, 1994
Just one of the 48 slaters taken from the thousands on Bulli Bay beach at Erith Island was a Beach Slater. As the gathering was not done by appearance, this species was much less common than the Sand Slater in the sampled section of the sand beach. Later a few specimens were obtained on the south-western coast of Penguin Island when the Sand Slaters were collected there.

Wrinkled Slater *Cubaris sulcifrons* Green, 1961
This Tasmanian endemic species has been found on six islands of the Furneaux Group and two of the far north-eastern islands.

Tamar Slater *Cubaris tamarensis* Green, 1961
The Tamar Slater was found on just five islands, including the three largest ones, of the Furneaux Group. Green (1961) described it as a Tasmanian endemic but its finding, at Tidal River, extended its range to mainland Australia.

Trim Slater *Cubaris* sp.
The three localities of this small slater are strikingly different. The first record was in scrub on coastal dunes behind the western end of Blyths Bay on the northern coast of Flinders Island. Next it was collected on the author's bush block by North Pats River on the same island. The vegetation there is shrubby *Eucalyptus ambigua – Eucalyptus globulus* woodland. It also extends a little onto the contiguous block of land, with similar vegetation, by the western boundary. The final record was made near the footings of the sometime barn on Barn Hill, the western rise of Deal Island. The calcarenite slope has been fired many times, reducing its vegetation to tussock-grass and Drooping Sheoaks *Allocasuarina verticillata*.

Spotted Slater ?*Merulana* sp.
As it was collected on 28 islands and islets, this species has the widest range of the undescribed species from the Eastern Straits. It was usually found close to the coast and the occurrence in the middle part of Lighthouse Gully on Deal Island is the furthest inland record so far. It can occur in very large numbers. Many hundreds were present when a collection was gathered from the decaying, lowest haulms of a hassock of Blue Tussock-grass *Poa poiformis* on Mile Island.

Island Slater *Sphaerilloides* sp. No. 1 (A species close to *Sphaerilloides* No. 1)
This undescribed slater was found only on the north-eastern islands and its sole record away from Hogan and Kent Groups was on the tiny and very exposed Pyramid Rock. The vegetation of the latter is mainly succulents and covers no more than about 60 m^2.

Flinders Island Slater ?*Sphaerilloides* sp. No. 2 (A species close to *Sphaerilloides* No. 2)
All the records of this taxon were made on Flinders Island. The first was one slater under a rotting log in Blue Gum *Eucalyptus globulus* subsp. *globulus* woodland on the north-eastern slope of the granite hill known as The Dutchman. It was noticed next in often-fired scrub on an ancient dune just north of Hays Lagoon in the north-east of the island. Much later it was collected in Blue Gum forest, with a rainforest understorey, in the mudstone massif near the centre of the island. Dr Bob Mesibov found it further east in the mudstone hills in the early 1990s (R Mesibov, pers. comm.). The author has not looked for it elsewhere on the island.

Garden Slater **Porcellio scaber* Latreille, 1804
Most of the islands where this slater has been recorded are still being grazed, or were grazed for many decades. Timber for farm-houses or huts, stockyards, shearing sheds and even fences, was carted to them. The Garden Slater could have reached the islands on timber or, more likely, with fruit trees and garden plants. While it is widespread in the settled districts of Flinders Island, and has spread far from farm-houses and dwellings, it has yet to be noted in undisturbed bush.

Shiny Slater **Armadillidium vulgare* (Latreille, 1804)
So far this large slater has been found only at four of the longest-settled parts of Flinders Island. These are Trousers Point (about 1890), Whitemark (late 19th Century), Pats River (1880s) and Settlement Point (early 1830s). It

seems to spread by slowly expanding its territories; hundreds were noticed on the first 120 m of a minor road just east of the Pats River airstrip in the Spring of 2000.

The scope of the collecting

Most of the collecting in the Furneaux Group was done in the course of travelling some 6500 nautical miles, to islands other than Flinders Island, the largest island of the group. The author's main interest lay in collecting lichen specimens, and in recording and collecting plants. While no island or islet was ever visited for the sole purpose of collecting slaters, some of the spots as small as Mile Island might have been worked adequately. The time taken for visits to more remote places, including Kent Group, totalled up to six months. The largest island of that group is Deal and it seemed to have been searched thoroughly. However, the finding of the Trim Slater *Cubaris* sp. as late as 1986 showed that, despite several days' work over the years, at least one taxon had been overlooked.

Less than 20 sites were worked on Flinders Island and so its fauna is little known. Most of the gaps in the table of occurrences, especially for islands smaller than Flinders Island, are probably the result of the limited time that could be spared for collecting there.

The few records of the slaters *Actaecia* spp., largely confined to sea shore sand beaches, may be more apparent than real. Specimens were obtained from three sea beaches but less than 10 have been searched. In late 2000 it was very surprising to find tens of thousands of slaters—in broad daylight—on the inner part of the eastern beach of the southern arm of the Pot Boil Lagoon in south-eastern Flinders Island. Many did not just work the damp sand and wrack but went out a little way into the adjacent shallows. They were so common that it was impossible to walk without standing on them. This seems to be the first occasion when the genus has been found away from sandy seashores. Lewis and Green (1994) do not record *Actaecia* spp. in any other habitat. However the record may not be as anomalous as it first seemed because the lagoon receives huge volumes of seawater, washed in over the dune at its mouth, during westerly gales. Even a moderate breeze can send water over the dune for some hours during high tide. The southern arm lacks the Salt Snail *Salinator fragilis* but does support the smaller salt-tolerant *Coxiella striata* (Whinray 2009). This finding of an *Actaecia* sp. or spp. was a matter of chance. Unfortunately the specimen spoiled and, despite two later visits, has yet to be re-collected.

Although a thorough collection of invertebrates was made by the author and Maureen Christie on Babel Island in four weeks of the summer of 1966-1967, none of the material was kept by the National Museum of Victoria.

Strzelecki National Park, including its summit, which at 782 m is the highest part of Flinders Island, has not been searched. Just one rainforest gully of the Mount Munro – Big Hill massif, which includes Cape Barren Island's summit of 711 m, has been sampled hastily at one locality. Thorough collecting on both massifs may yield species that do not occur on the islands' lower ground.

No more than an hour was spent searching at Tidal River on Wilsons Promontory.

Discussion

Several of the already described native slaters, and most of the undescribed novel taxa, are of Tasmanian origin. An exception could be the Spotted Slater ?*Merulana* sp. This genus occurs on the Australian mainland but has yet to be found anywhere in Tasmania. The Spotted Slater is so widespread in the eastern Straits, that it is likely to have evolved before the sea level rose after the last glacial period. As it has reached Swan Island, it is hard to understand why it did not cross the gap of exactly three km to the Tasmanian mainland. Green (1961, 1966, 1970 and 1974) and Lewis and Green (1994) do not list any specimens north of a line from Bridport to The Gardens on the east coast. Collecting in the far north-eastern corner may yet show that it reached that part of the State.

The author's sampling at Wilsons Promontory was very minor. Green (1974) remarked that most of the collecting of slaters on the Australian mainland had been done in New South Wales and Queensland. A thorough survey of the species of Wilsons Promontory would establish the fauna of the area and show whether other taxa described as endemic to Tas-

mania, and the species close to *Merulana* sp., occur there.

The two former Tasmanian endemics, the Wrinkled slater *Cubaris sulcifrons* and the Trim Slater *Plymophiloscia ulverstonensis* are likely to have evolved in mainland Tasmania and to have crossed to the Australian mainland before the land bridge was severed after the last glacial period.

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As the sometime Curator of Invertebrates at the Tasmanian Museum and Art Gallery, AJA Green encouraged my collecting and named most of the specimens. She also supplied six off-prints of her papers. Maureen Christie was very helpful from 1966 to 1972. Catherine Tierney helped on Deal Island in late 1974. GWG Goode's small boat was used in the Furneaux Group, and for a visit to Cygnet and Little Swan Islands, between 1972 and 1981. At least 20 others helped with visits to islands. The many recent drafts of this contribution were typed at the Online Access Centre on Flinders Island.

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Eighty-four years ago

Notes on the coleoptera of Northwestern Victoria. Part xiv
By JC Goudie

GENUS PAROPSIS

This genus contains a greater number of species than any other genus of Australian coleoptera. They are robust, very convex, smooth beetles of rounded oval form, and are found usually clinging to the leaves of low bushes, the shoots or suckers of eucalypts are especially favoured by them. Many of the species are beautifully coloured, but often the bright colours fade entirely after death, becoming a dull yellow or brown. Others are adorned with spots, bars or stripes of fixed colours. The larvae, which feed on the gum-leaves, are short, stout, grub-like creatures; they cluster together when young, afterwards separating.

6736. *Paropsis aenipennis,* Chp. Underside, parts of head, and margins of prothorax castaneous, remainder dark olive green. Quarter inch long. Taken on Myall, near Ultima.

6757. *Paropsis beata,* Newm. A smooth, shining black species 7-16th inch in length, having the margins of prothorax and elytra and three spots on each elytron red.

Paropsis dryope, Blackh. One of our smallest kinds, measuring only ⅛ inch. Testaceous, with very variable black markings.

6836. *Paropsis intacta,* Newm. Yellowish - brown, striated, margins of elytra paler. Head and proth spotted black. *Paropsis mystica,* Blackb. Brown, the elytra with two transverse yellow markings on each; about the size of *intacta*.

6880. *Paropsis nigrovittata,* Chp. An almost hemispherical species, ⅜ inch in length; Testaceous, elytra each with 10 longitudinal black lines.

6890. *Paropsis obsoleta,* Oliv. Reddish-yellow, elytra with three transverse rows of indistinct dark spots. 5-16th inch in length.

6988. *Paropsis variabilis,* Chp. Light yellow, ⅜ inch; parts of head, and a large blotch on shoulders of elytra, black. Elytra finely but distinctly striate-punctate.

In addition to the above, about nine species, which have not been identified, occur.

From *The Victorian Naturalist* **XLIII**, pp. 305–306, February 1927

A call record of the Southern Barred Frog *Mixophyes balbus* from East Gippsland

The Southern Barred Frog *Mixophyes balbus* is a large frog (to 80 mm) that historically occurred along the eastern slopes of the Great Dividing Range, extending from East Gippsland in Victoria to north-eastern New South Wales (DSEWPC 2011; DSE 2009a; NSW DECCW 2005). This species has undergone widespread decline across much of its former range (Mahony 1993; Tyler 1997), particularly in the southern portion, where it has been recorded at only three localities south of Sydney in the last 10 years (Daly *et al.* 2000; White 2000; Hunter 2001, cited in Gillespie 2011). This species is classified as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and classified as Critically Endangered in Victoria (DSE 2007).

Mixophyes balbus has been recorded only three times in Victoria. These records are from East Gippsland including along the Tennyson River, Cann River (east branch) and Jones Creek (DSE 2009b). The last record was submitted to the Atlas of Victorian Wildlife database (AVW) in 1982 (DSE 2009b). Surveys for *M. balbus* in Victoria during the late 1980s and 1990s (Lugg *et al.* 1993; Holloway and Osbourne 1996), and more recently in 2010 (Gillespie 2011) have failed to locate this species.

This note describes an incidental and probable record of *M. balbus* from the Thurra River in East Gippsland, recorded during targeted surveys for large forest owls in March 2011.

Ecology

Previous studies have cited habitats for the Southern Barred Frog that include an association with permanent first-order streams through temperate and sub-tropical rainforest and wet sclerophyll forest (Mahony *et al.* 1997) and moist gullies in dry forest (Gillespie and Hines 1999, cited in DSEWPC 2011). While research in NSW has improved knowledge of this species (e.g. Lemckert *et al.* 1997; Daly 1998; Daly *et al.* 2000; White 2000; Donnellan and Mahony 2009), the ecological requirements and constraints affecting its abundance and distribution in Victoria are still poorly known due to the paucity of records.

Based on records of *M. balbus* in NSW, modelling (NSW NPWS 1994 in Gillespie and Hines 1999) indicates that the species shows a preference for the interior of large tracts of forest in areas with relatively cool mean annual temperatures. These sites are typically free from any disturbance such as land clearance, forest grazing or other significant human impacts upstream, which may indicate that it is highly sensitive to perturbations in the environment (Mahony *et al.* 1997; Gillespie and Hines 1999).

Breeding sites are confined to a narrow niche, with eggs generally deposited within an excavation (in the gravel or leaf litter) in shallow running water between pools (Knowles *et al.* 1998). The tadpoles, described by Anstis (2002), Watson and Martin (1973) and Daly (1998), are highly distinctive and tadpole searches are considered to be an integral component of survey for *M. balbus* (Gillespie 2011).

Many factors may be involved in the decline of *M. balbus* across its range, including climate change, habitat loss and degradation, changes to hydrology and water quality, predation of eggs and tadpoles by introduced fish, and disease such as the Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis*. Chytrid fungus has been implicated in the decline of many amphibian species (Commonwealth of Australia 2006), and Gillespie (2011) considers this the most likely cause of decline and/or disappearance of *M. balbus* in Victoria. Impacts from habitat modification and loss and/or predation by exotic fish are discounted by Gillespie (2011), as much of the remaining habitat in east Gippsland is relatively undisturbed and the water systems are largely free of exotic predatory

fish species such as trout. Impacts from predation by exotic mammalian predators such as foxes and cats are unknown (Gillespie 2011).

Record

During project work for large forest owls in East Gippsland, Ecology Australia staff undertook a nocturnal survey on 24 March 2011 at a site on the Thurra River, approximately 3 km south of Coopracambra National Park (Fig. 1). Weather conditions were overcast with light to moderate rain, and the survey period followed heavy rainfalls throughout East Gippsland, which resulted in the flooding of several rivers in the region. The survey began at approximately 8.30 pm and finished at approximately 10 pm.

Upon arrival at the site a number of frogs were heard calling, including the Victorian Smooth Froglet *Geocrinia victoriana*, Dendy's Toadlet *Pseudophryne dendyi* and Peron's Tree Frog *Litoria peroni* (see Table 1). During the survey period, repeated calls that closely resembled those of *M. balbus* were heard. Each call consisted of a cadence of approximately six to 10 notes over approximately two to three seconds. Southern Barred Frog call-playback (recording by Murray Littlejohn) was then conducted, to which the frog responded with further calls. Active search in the area was then begun; however, the individual ceased calling and could not be located. As no further calls were heard from this individual, the project survey work resumed.

Ecology Australia staff subsequently revisited the site on 5 and 6 April 2011. Weather conditions during the second trip were generally fine or cloudy without rain, after little rainfall in the preceding week. Further call-playback surveys and active search for this species were undertaken, but no individuals were recorded. Frog activity was significantly less than during the first survey with only two species recorded (*G. victoriana* and *P. dendyi*), and in substantially less numbers. A habitat assessment was undertaken within the riparian zone of the Thurra River.

Fig. 1. Approximate location of the survey site along the Thurra River, East Gippsland shown by red star (Biodiversity Interactive Map - DSE 2011).

The Ecological Vegetation Class (EVC) at the site is Warm Temperate Rainforest (EVC 32), which occurs as patches in a linear strip of Riparian Forest (EVC 18) along the Thurra River (DSE 2011). Vegetation within approximately 100 m of the riparian zone is Damp Forest (EVC 29). The habitat assessment confirmed the presence of elements of Warm Temperate Rainforest/Wet Forest throughout the site, including a relatively dense canopy and mid-storey and the presence of numerous wet-site species (see Table 2).

In-stream habitat at the site comprises a sandy substrate supporting submerged vegetation, largely Water Ribbons *Triglochin* sp. Little emergent vegetation and numerous snags, logs and branches occur in, or over, the waterway, with fringing vegetation comprising numerous ferns, sedges and rushes. The site supported a relatively high level of organic litter, which may be important for *M. balbus* as refuge and egg nests sites (Knowles *et al.* 1998).

The site was adjacent to an access track; however, the track was overgrown and impenetrable beyond the site. The presence of a number of mature and senescing trees (Mountain Grey Gum *Eucalyptus cypellocarpa* and Manna Gum *E. viminalis*) in the vicinity of the site suggests that the site is unlikely to have been intensively logged recently. This is supported by interrogation of DSE's Forest Explorer Online (v4.1, accessed 5 May 2011), which shows that no commercial logging has been undertaken within approximately 300 m of the site in at least the plast four decades.

Conclusion

The authors recognise the uncertainties associated with call-playback records for amphibians generally, and particularly for rare or cryptic species. Given the repeated calls heard, which were mostly attributable to the Southern Barred Frog, the presence of potentially suitable habitat at the site, and the status of this species in Victoria, we consider that the site and surrounding areas of suitable habitat on the Thurra River warrant further investigation for the potential presence of the Southern Barred Frog.

Table 1. Fauna species recorded during nocturnal survey on the Thurra River, East Gippsland.

Scientific Name	Common Name
Geocrinia victoriana	Victorian Smooth Froglet
Litoria nudidigita	Leaf Green Tree Frog
Litoria peronii	Peron's Tree Frog
Mixophyes balbus	Southern Barred Frog
Ninox novachollandiae	Boobook Owl
Pseudophryne dendyi	Dendy's Toadlet
Tyto tenebricosa	Sooty Owl

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The authors would like to thank B Schmidt for assistance with fieldwork, and G Gillespie and M Mahony for information on the ecology/natural history of *M. balbus*. S Henry (DSE, Orbost) kindly provided unpublished information. The large forest owl project was commissioned by the Department of Sustainability and Environment.

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Table 2. Common Flora species recorded at the survey site on the Thurra River, East Gippsland.

Scientific Name	Common Name
Asplenium sp.	Necklace Fern
Blechnum nudum	Fishbone Water fern
Coprosma quadrifida	Prickly Currant-bush
Gahnia sieberiana	Red-fruit Saw-sedge
Microsorum sp.	Kangaroo Fern
Leptospermum trinervium	Paperbark Tea-tree
Lomandra longifolia ssp. *longifolia*	Spiny-headed Mat-rush
Parsonsia brownii	Twining Silkpod
Pimelia axiflora ssp. *axiflora*	Bootlace Bush
Pomaderris aspera	Hazel Pomaderris
Smilax australis	Austral Sarsaparilla
Syzygium smithii	Lilly Pilly
Tristaniopsis laurina	Kanooka
Hymenophyllum sp.	Filmy Fern

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Frogs on the verandah

Change is a constant factor in the life of all species; something that often cannot be controlled but must be adapted to. Unfortunately, the extent and speed of change often do not allow for easy adaptation, and species are becoming extinct. For example, the processes of urbanisation, a major source of change for many native species, are ever increasing. It is predicted that by 2025 more than 60% of the human population will reside in urban settlements.

The Save the Frogs Foundation in America reports that more than a third of the globe's frog species are disappearing. Destruction of habitat associated with human population growth is one of the most important causal factors. Some frog species, however, are quite adaptable. One such species is the Southern Brown Tree Frog *Litoria ewingii*. This small frog has become common in our urban settlements while others have disappeared. In urban gardens, these frogs can be found in temporary and permanent water bodies, amongst vegetation, under logs and rocks and in the water of bowls beneath potted plants.

In 2006 four individuals took up residence on the front porch of my house in Croydon, Victoria, specifically in one of the rosettes of a potted bromeliad (Fig. 1). One frog resided in the 'well' formed by the rosette of leaves, the other three in the axils of leaves on the same stem, each in its own small 'pool' that diligent watering maintained. This was a particularly dry year and the four frogs remained in their bromelliad ponds for nine months before conditions became sufficiently moist to entice them further afield.

I was informed that they had taken up residence on the porch early in September of 2006, by a cacophony of rapid and harsh calls, surprisingly loud considering they were only small frogs. Of an evening, I would see them venture from their homes either to the tips of the bromeliad leaves or to the *Dianella* below the porch, where they would await their dinner

of unsuspecting insects. Throughout their nine month residency, they did not venture far but when winter came they moved out. The two in the upper storeys left first; three weeks later the other two left. Both the frogs that remained a little longer moved to the higher positions on the plant. After they left the bromeliad, the frogs could be heard calling from the front yard, but it took several more weeks before calls were heard from the back yard. Frogs had previously been in the back yard because of a large pond. During the decade-long drought, the pond had been reduced to a small puddle, fed by the runoff directed to it from the house roof. The September of 2006 was the driest on record and followed a particularly dry summer, autumn and winter, possibly explaining why the frogs had moved to the bromeliad. The winter of 2007, however, was drier than that of 2006 so I hoped the frogs would not regret their move. Diligent watering of the bromeliad was continued, just in case.

The Southern Brown Tree Frog is relatively small; adult females grow to about 45 mm while adult males are slightly smaller. The species frequently is pale brown in colour although the occasional green individual occurs (http:frogs.org.au >Frogs of Australia). A dark stripe runs from the snout, through the eye to the shoulder (Fig. 2). Below this is a white or pale stripe. A broad brown band begins between the eyes and runs down the back. The skin has low tubercles (Fig. 3). The frog is an agile climber and has well developed climbing discs on fingers and toes. There is no webbing between the fingers but webbing occurs to halfway between the toes. The backs of the thighs are yellow to red-orange (http:frogs.org.au >Frogs of Australia). Those of the frogs observed were red-orange.

Small eggs have been observed in the pond regularly, in large gelatinous clusters attached to stems of vegetation, a little below the water level. The tadpoles themselves were quite shy and would disappear quickly when the water was disturbed.

This frog can be found in many habitats ranging from coastal lagoons and swamps to semi-arid regions, native vegetation and farm-

Fig. 1. Southern Brown Tree Frogs *Litoria ewingii* using a potted bromeliad.

Fig. 2. *Litoria ewingii*: note dark stripe running from snout, through eye to shoulder and climbing discs on fingers and toes.

Fig. 3. *Litoria ewingii*: note the low tubercles on the skin of this very pale specimen.

land, thus it is not surprising that this species would adapt to the urban environment. Its distribution ranges from eastern South Australia, through southern Victoria and into southern New South Wales (Robinson 2002). It also occurs throughout Tasmania, including the Bass Strait Islands, and has been introduced to New Zealand (Robinson 2002).

The Southern Brown Tree Frog is on the IUCN red list of threatened species but the population is considered stable and classed as 'least concern'; however, this species is increasingly threatened by urban creeps, disease (e.g. Chytrid fungus) and climate change.

Prior to gaining our tenants on the front porch, four different frog species commonly were heard to call in the back yard and periodically were sighted, and their tadpoles were commonly found in the pond. The two most frequently heard frogs were the Southern Brown Tree Frog and the Pobblebonk *Limnodynastes dumerilii*. The Common Froglet *Crinia signifera* was sometimes heard or seen. The fourth frog species was the Spotted Marsh Frog *Limnodynastes tasmaniensis*. Since the drought, the Pobblebonk has not been heard but one is hopeful that its bonking will be resumed.

Household gardens are increasingly recognised as being able to provide habitat; books to promote biodiversity in urban areas by using the front- and back yards of households are becoming easier to obtain. 'Bonking in the Garden' (available at http://frogs.org.au > frogwatch) is an easy-to-read booklet that explains simply how to create a frog-friendly garden. A pond is not necessary although one somewhere in the near neighbourhood would promote the likelihood of having froggy visitors. A frog-friendly garden may not prevent habitat-specific species from becoming extinct but, as the booklet says, 'There are frog species which are now extinct that were once so common that no-one bothered to study them, instead turning their attention to rarer species. Providing refuge for species in degraded areas is essential if we wish to make sure that they too don't join the ever increasing list of threatened frogs' (p.2). Get the booklet, read it, do some gardening and enjoy some bonking in your garden.

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Peter Graeme Kelly

30 June 1922 – 17 May 2011

Peter Kelly, who died in May 2011, just short of his 89th birthday, played a significant part in the activities of the Field Naturalists Club of Victoria. He was elected to the Club in February 1963 and two years later became Honorary Librarian, a position he held for nine years. In recognition of this length of service he was granted an Honorary Membership in 1972. He undertook the duties of Librarian again from 1980 to 1982. From 1973 to 1976 Peter was President of the Club and was a member of Council from 1991 to 1992.

Peter Kelly was a keen entomologist; in his President's address at the AGM in 1974, he spoke of his own studies of the *Paropsis* beetles, giving the history of the study of the genus and an insight into the complexities of its taxonomy. His knowledge of entomology was evident also in his review of a couple of books, published in *The Victorian Naturalist* in 1971 and 1995.

He was a member of the Marine Biology and Entomology Group and of the Microscopical Group. In 1996 he made a valuable donation to the Microscopical Group of his Nikon Research microscope with a binocular camera attachment and polarising accessories, as well as other microscopical equipment.

Peter Kelly was a member of the Entomological Society of Victoria and, in 1992, was awarded the Zoo Le Souef Entomology Award, established in memory of JC 'Zoo' Le Souef in 1983.

Book reviews by Peter Kelly

Australian butterflies by Charles McCubbin. *The Victorian Naturalist* **88** (11), 1971, 324

Australian beetles by John F Lawrence and EB Britton. *The Victorian Naturalist* **112** (6), 1995, 324

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Frogs and Toads

by Chris Mattison

Publisher: *Natural History Museum, London. 2011.192 pages, hardback.*
ISBN 9780565092627. RRP $49.95

'What a wonderful bird the frog are!' says the old poem; and indeed this handsome book will almost have you believing that frogs rival birds for variety and colourfulness. Chris Mattison is a past runner-up in the Wildlife Photographer of the Year competition, and the photographs in the book, mostly his own, are excellent. But it is not just a coffee-table book: the text is a thorough and up-to-date summary of frog biology. About two-thirds of it covers origins and classification, size and shape, colour and markings, interactions with the physical environment, enemies and defence, food and feeding, reproduction, life-cycles, habitat and distribution, and frogs and man. The last and longest chapter provides a thumbnail sketch of each of the families. How many are there? A 1981 frog book on my shelf lists 12; Mattison's tally is 49. The explosion is due largely to the insights being supplied by molecular methods, and I don't for one moment suppose that the present assessment will be the final one.

Scattered through the main text are boxed sections treating such topics as 'Polymorphism', 'Poison dart frogs and South American Indians' and 'Urban frogs'. These, like the rest of the text, are succinct and well-organised; indeed, the general quality of writing and editing is outstanding. The only blemish I could find is the common misapprehension that the sound-generating structures in the larynx are vocal 'chords' rather than 'cords'.

Mattison's broad knowledge of frogs is vastly greater than mine; hence the only way I can test the accuracy of his account and the breadth of his coverage is to choose little bits that I am familiar with, and see how well he handles them. An old friend from African days, for instance, the Gray Tree Frog *Chiromantis*, is remarkable in at least two aspects of its biology: it conserves water by excreting uric acid rather than the urea or ammonia typical of amphibians. And its spawn is placed in foamy nests on branches overhanging water; a number of males may join an amplectant pair and try to sneak some of their sperm in, so that a spawning aggregation of a dozen or more frogs in a mass of white froth sometimes results. Not only does Mattison know about these things; he also provides a gorgeous photograph (p. 86) of a spawning aggregation in action.

There are a couple of minor irritations. The photo captions don't include the size of their subjects; so, for instance, on p. 93 there's a fine photo of a male African Bullfrog caring for his tadpoles, but no indication that on the froggy scale of things this species is *huge*, weighing up to 1 kg. And where a species' photo is a long way from the species account (as in this case; the text on the species is on p. 177), the text doesn't tell you where the photo is.

I could have wished for a little more on mating calls and a little more on tadpoles, but that doesn't alter my view: this is a valuable, attractive and comprehensive book which I recommend wholeheartedly. If you like frogs you'll love it; if you're indifferent to frogs it will change your mind.

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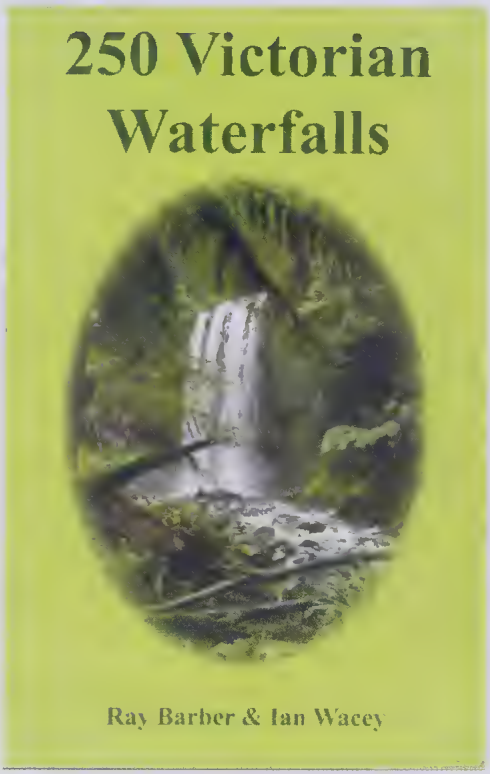
250 Victorian Waterfalls

by Ron Barber and Ian Wacey

Publisher: *Ian Wacey, Eltham North, Victoria 2011. 320 pages, paperback, colour photographs. ISBN 9780646543314. RRP $49.95*

What a great idea for a book! To track down, visit and photograph 250 waterfalls in Victoria over six years is an amazing achievement and a tribute to the authors' persistence, patience and dedication to their goal.

Each entry on a waterfall contains information on its location, directions to it, the closest town, approximate time and distance from Melbourne, vehicle and walking access, facilities available nearby, and other points of interest. There are also references to the sources of information accessed by the authors while researching the details printed in the text.



The whole is illustrated with superb photos, not only of waterfalls, but also other points of interest and sometimes the flora and fauna spotted during the forays.

I did have one complaint about the book and that was in the arrangement of each waterfall alphabetically under municipal area, also arranged alphabetically. This resulted in waterfalls, which can be accessed from the same parking area, being separated in their municipal groupings, with the same information for access, closest town, time and direction from Melbourne repeated for each one. It might have been more helpful for anyone who wanted to visit these waterfalls to have all of those close to be arranged together.

The arrangement of entries under municipalities was useful, but unfortunately the alphabetical ordering of councils led to some anomalies with neighbouring shires such as Colac Otway Shire and Surf Coast Shire at opposite ends of the book. An east-west or west-east arrangement across the state might have been more appropriate.

Apart from that this is an excellent book which provides great inducement to make your own visits to see many of these waterfalls. The authors have hinted that there are more waterfalls out there – I will look forward to the next edition with much interest.

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Thank you from the Editors

The Victorian Naturalist could not be published, and would not be successful without the enormous amount of time and effort given voluntarily by a large number of people who work behind the scenes.

As always we particularly thank our authors, who provide us with excellent material for publication.

One of the most important editorial tasks is to have papers refereed. The Editors would like to say 'thank you', therefore, to the following people who refereed manuscripts that were published during 2011:

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Submission of a manuscript will be taken to mean that the material has not been published, nor is being considered for publication, elsewhere, and that all authors agree to its submission.

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Abbreviations
The following abbreviations should be used in the manuscript where appropriate (italicised as indicated): *et al.*; pers. obs.; unpubl. data; pers. comm. (followed by a date); 'subsp.' for subspecies.

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All nucleotide sequence data and alignments should be submitted to an appropriate public database, such as Genbank or EMBL. The accession numbers for all sequences must be cited in the article.

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A style guide for *The Victorian Naturalist* is available on our website. For further information on style, write to the editors, or consult the latest issue of *The Victorian Naturalist* or edition of *Style Manual for Authors, Editors and Printers* (John Wiley & Sons: Milton, Qld).

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Lunney D (1995) Bush Rat. In *The Mammals of Australia*, pp. 651-653. Ed R Strahan. (Australian Museum/Reed New Holland: Sydney)

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Mammals – Menkhorst PW (ed.) (1995) Mammals of Victoria: Distribution, Ecology and Conservation. (Oxford University Press: South Melbourne)

Reptiles and Amphibians – Cogger H (2000) *Reptiles and Amphibians of Australia*, 6 edn. (Reed Books: Chatswood, NSW)

Insects and Marine Creatures – ABRS: <http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/index.html>

Birds – Christidis L and Boles WE (2008) *Systematics and taxonomy of Australian birds*. (CSIRO: Collingwood, Victoria)

Plants – Walsh NG and Stajsic V (2007) *A Census of the Vascular Plants of Victoria*, 8 edn. (Royal Botanic Gardens of Victoria: Melbourne)

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